

ANSI C63.10: Procedures for testing compliance of a wide variety of unlicensed wireless devices

New standard brings to one place all reference material needed for performing tests

ANSI C63.10 “Standard for Testing Unlicensed Wireless Devices,” published by the Institute of Electrical and Electronics Engineers on September 10, 2009 by the American National Standard Institute (ANSI) Accredited Standards Committee (ASC) C63° Electromagnetic Compatibility, is a compilation and assemblage, in one document, of measurement procedures for testing many unlicensed wireless devices for compliance with the Rules and Regulations of the Federal Communications Commission (FCC). Previously, these procedures had to be determined using sources in several different places, including in the FCC Rules and public notices, its Knowledge Data Base, rule making documents and ANSI C63.4, among others.

The compliance test procedures in clause 13 of ANSI C63.4 for unlicensed wireless devices are no longer sufficient for determining compliance of many of the new wireless devices currently on the market. At the appropriate time, C63.4 will be evaluated to remove those portions (or all) of clause 13 that ANSI C63.10 will cover as the committee needs to determine if there are other uses of the clause. Also, many portions of C63.4, such as the test instrumentation and test site specification, were repeated in large part in the 2009 edition of C63.4.

The TCB (Telecommunication Certification Body) Council initiated the idea of this standard because testing and certifying [FCC] Part 15 intentional radiators was

confusing and difficult as the actual test methodology was spread around in many different documents and policies, said Dennis Ward, vice-chairperson of the Executive Committee of the TCB Council. “It was felt by the Council that one standard should be put together that incorporated all of these documents.”

To this end, the TCB Council contracted Art Wall of Radio Regulatory Consultants to head up the endeavor. The standard was initiated under the C63 auspices and work began. “The premise was, ‘No new procedures are to be made or introduced,’” Ward said.

“While it took longer than the TCB Council had initially hoped, it is one of the quickest standards productions to date. This could be because it basically took existing procedures, etc., and put them in one basket,” he said. “Some minor attempts to reinvent the wheel were introduced, but Art Wall did an excellent job of keeping the purpose. To this end, we now have a standard that should be much easier to use than the multiple documentation spread about as before.”

As users, manufacturers, regulators and others prepare to purchase these ASC C63° standards, *Interference Technology* asked a panel of experts to weigh in on the implications and the effects of the standard on lab operations.

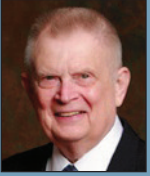
In addition to Art Wall and Dennis Ward, participants included: Mark Briggs, Desmond Fraser, Don Heirman, Werner Schaefer and Bill Stumpf.



Mark Briggs is one of the EMC Staff Engineers at Elliott Labs, an NTS company, a test lab, TCB and Notified Body in the San Francisco Bay Area. Mark has been involved in EMC and Radio testing since 1993.



Desmond Fraser is president of Rhein Tech Laboratories, Inc., in Herndon, Va., and director of AmericanTCB, Inc., in McLean, Va.



Donald Heirman is president of Don HEIRMAN Consultants. He chairs, or is a principal technical contributor to, standards organizations, including ANSI ASC C63® (chairman) and the International Electrotechnical Commission's Special International Committee on Radio Interference, where in October 2007 he was named the chair of CISPR.

He is a member of the IEC's Advisory Committee on EMC and the Technical Management Committee of the US National Committee of the IEC.



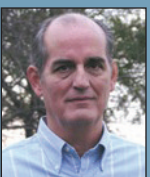
Werner Schaefer is a compliance quality manager and technical leader for EMC and RF/uwave calibrations Cisco Systems' Corporate Compliance Center in San Jose, Calif. He is the chairman of CISPR/A/WG1 and a member of CISPR/A/WG2 and CISPR/B/WG1. He also is the US Technical Advisor to CISPR/A and a member of

ANSI C63 and SC1/3/5/6/8. He was actively involved in the development of the new standard ANSI C63.10 and the revision of ANSI C63.4.



Bill Stumpf is a 1979 graduate of DeVry Institute of Technology. He has been a test facility manager for DLS Electronics Systems, Genoa City, Wis., since 1984, working in the field of EMC measurement and consulting for over 27 years. Bill is a member of the TCB Council

Board of Directors, the IEEE EMC Society, and an active member of the Accredited Standards Committee C63® since 2004, including activities on the C63.10 working group and associated task groups.



Art Wall is Chairman of the Wireless Working Group (WWG) facilitating in the development of test procedures for compliance testing of unlicensed wireless devices, ANSI C63.10. The WWG is now working on Edition 2 of C63.10, which will include more controversial test procedures for unlicensed transmitters and a new

standard for compliance testing licensed transmitters. Art retired in 2005 from the Federal Communications Commission as Deputy Chief of the FCC Laboratory. He is principal consultant for Radio Regulatory Consultants, Inc.



Dennis Ward is the Director of Engineering and senior applications examiner for AmericanTCB. He is a Notified Body for ATCB and provides this function for the current EMC and RTTE Directives. Dennis has been directly responsible for accreditation issues and activities supporting Telecommunications Certification Bodies,

accreditation to ISO Guide 65 and ISO Guide 17025. He has been an EMC, ESD and NARTE-Accredited Test Laboratory Engineer.

WHAT WERE SOME OF THE FACTORS THAT DETERMINED A NEED FOR THIS MAJOR UPDATE OF ANSI C63.4 AND/OR ANSI C63.10?

STUMPF: ANSI C63.10 is a new standard. The need was seen to develop a standard that would address the test procedures for unlicensed wireless devices. Until now, this information was scattered around in guidance documents, application notes, ANSI C63.4, FCC inquiry responses, FCC and IC (Industry Canada) Rules, and various other FCC and IC publications. The goal of the first edition of this standard was to gather all these accepted procedures and incorporate them into one document.

SCHAEFER: The introduction of test site requirements [in the current edition of ANSI C63.4 which is a normative reference in C63.10 (as there is no date on the C63.4 reference)] for the frequency range above 1 GHz (to 18 GHz) is a major change from the previous versions [of C63.4]. For the first time, specific requirements for a test environment in the frequency range above 1 GHz are presented to ensure the appropriateness of test sites. In the past, the standard simply stated that the test site would be suitable for measurements above 1 GHz if it met the existing requirements for the frequency range below 1 GHz (namely the NSA requirement). This statement, of course, was not technically sound, for many reasons. The measurement above a conducting ground plane (as required for testing below 1 GHz) is not viewed to be suitable for testing above 1 GHz since emissions become much more directional (as well as most antennas!) and a "reflection free" environment provides much better repeatability of test results. Therefore, a "free-space" environment is preferred. In practice, this means that a test site has limited reflections in the testing area.

The purpose of the newly introduced method [in C63.4], developed by IEC CISPR/A, is to determine residual reflections in the testing area and checking these reflections against an acceptance criterion. If a site does meet the criterion, it is deemed suitable for testing up to 18 GHz. It should be noted that there are still no test site requirements for the frequency range between 18 GHz and 40 GHz -- a frequency range that may have to be covered by emission measurements, depending on the device to be tested. The provision of new test site requirements that are in harmony with international requirements will ensure reproducibility of test results and acceptance of test data in a global context.

The use of spectrum analyzers for compliance testing was permitted in ANSI C63.4 for a long time. This is contrary to international requirements, namely IEC CISPR standards. Spectrum analyzers are used in most testing laboratories, due to their distinct advantages over traditional EMI receivers. However, there are some shortcomings of spectrum analyzers compared to EMI receivers like input overload protection, amplitude auto-ranging, and system sensitivity, to name the most important ones, that require in-depth knowledge of EMC testing personnel. The

new [edition] of ANSI C63.4 addresses the sensitivity issue and the linear operation of spectrum analyzers in detail, in a manner that is easily understandable and thus can be integrated in existing testing procedures. These additions to the standard will help avoid erroneous measurement data and improve the reproducibility of test results.

It has been known for some time that the material, construction and shape of setup tables used to position tabletop equipment has an impact on radiated emission test results. An evaluation method developed by committee IEC CISPR/A has been adopted and included in [the new edition of] ANSI C63.4 that allows the determination of the uncertainty contribution of a setup table on radiated emissions measurements. This influence of setup tables used in a laboratory is based on actual measurements that require a specific test setup and antenna. A simple mathematical process is available to determine the magnitude of the uncertainty contribution of such setup tables.

WHEN WILL THE 2009 EDITIONS OF C63.4 AND C63.10 BE REQUIRED FOR COMPLIANCE? WHEN DO YOU ANTICIPATE THAT CLAUSE 13 OF C63.4 WILL BE REPLACED ALL OR IN PART BY C63.10?

HEIRMAN: This is, of course, up to the FCC. But note that

last fall C63[®] filed with the FCC for their biennial review that the latest version, or the first version in the case of C63.10, be referenced in the Rules as soon as possible. This is needed for manufacturers to have comfort in using these new standards, which contain updated information.

All of the C63[®] standards have a time for the customer to get used to before being changed again. The customer does not like to be in an ever-changing situation nor do regulators referencing the standard. Therefore, most of the ASC C63[®] standards have at least a two- to three-year (and sometimes much longer if technology in them has not changed) no-change window. Of course, if there is an urgency, that can be reconsidered. Also, there is a formal process to ask for interpretations and explanations of any C63[®] standard that can come at any time, which can handle any pressing needs. These interpretations are added to the standard or are available to those that purchased standards.

SCHAEFER: The availability of new standards does not mean that they are applied immediately to perform compliance measurements on products to demonstrate that these devices do in fact meet regulatory requirements as called out in 47 CFR Part 15. The FCC has identified ANSI C63.4-2003 as the mandatory test method for demonstrating compliance of digital devices with FCC rules. The new revision of ANSI C63.4 must be incorporated in the FCC

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rules for it to become mandatory. Such changes do have to follow published processes that require time. On the other hand, a transition period may be feasible where either the current version of ANSI C63.4 can be used or the new version. The same applies to the new standard ANSI C63.10, which summarizes all the currently applicable test methods for radio testing. Some methods were included in ANSI C63.4-2003, others were included in documents prepared by the Office of Engineering and Technology (OET) of the FCC. In order to make ANSI C63.10 the mandatory standard for testing radio devices, it must be included in the FCC rules.

WHAT ARE THE REGULATORY IMPLICATIONS?

SCHAEFER: [As indicated earlier,] ANSI C63.4 introduces new requirements for test sites used for radiated emission measurements above 1 GHz. The test sites now have to be evaluated using the SVSWR method and must meet the set acceptance criterion of 6 dB. This is a truly new requirement that has not been in place before. There is a new requirement for the operation of VDTs during emissions testing that may require a change of correctly used test methods. On the other hand, no new requirements were introduced by ANSI C63.10 since this document only includes test methods that are in use already. The document provides a significant simplification for users since all relevant methods are now included in a single document but no new requirements have been introduced.

HEIRMAN: It is clear that if the regulations indicate that the standard must be used, it must be used. If the user, such as a test laboratory, makes any deviation, that would have to be justified to the FCC. That process is not an easy one and may take time that will be detrimental in getting product to market.

WHAT CHALLENGES MIGHT LABS ENCOUNTER FROM APPLYING THE NEW ANSI C63.10 OR WILL IT MAKE THINGS EASIER?

BRIGGS: Based on what I know about the ANSI C63.10 standard it should prove to be easier than the current way of making measurements, which is having to look in both ANSI C63.4 and the various FCC KDB (knowledge data base) publications, report and orders and dockets that modify the methods in ANSI C63.4 for specific rule parts or product types.

WARD: While new test labs coming into the industry may have some problems, those labs which operated under the “old way” will find [C63.10] fairly easy to use.

WHAT EDUCATION AND TRAINING IS NEEDED FOR PERSONNEL TO MEET THESE STANDARDS AND HOW WILL YOU IMPLEMENT IT?

FRASER: As 63.10 is mainly a consolidation of procedures already in place, training will mainly be a review of the standard and how its various sections map to our current procedures.

BRIGGS: For ANSI C63.10 this is a matter of modifying report templates to reference the standard when it becomes adopted. As this is (hopefully) nothing more than a collection of the existing test requirements in a single document, no significant training should be required other than becoming familiar with its contents. Hopefully, it will allow test procedures to be streamlined by simply referring to the single ANSI document rather than to multiple possible sources of test procedures and methods.

HEIRMAN: While it may be that the learning curve for testing unlicensed transmitters using C63.10 is not long as the contents are a compilation of what to do for compliance testing from many sources that exist, there will be a need to know what is in C63.10, especially as it encompasses many clauses in the newly published C63.4. C63.4, for example, now includes test site validation requirements above 1 GHz which has to be taken into account.

WHAT DO YOU EXPECT WHEN ASSESSED ON THE USE OF THESE STANDARDS BY A LABORATORY ACCREDITING BODY?

WARD: Ideally, since there are no new test methods, assessment should be similar except that the specific standard reference would be added to the scope. But, hey, there is always a loose monkey wrench laying about that might get dropped into the works.

FRASER: Would probably wait for FCC adoption of standard before adding to scope, or closely time with adoption.

WHAT IS THE IMPACT OF C63.10 ON EMC PRODUCT DESIGN?

WALL: C63.10 should make it easier for manufacturers and laboratories to determine compliance with mandatory EMC standards and thereby bring more devices to the market with less testing and less confusion.

SCHAEFER: The measurements used to validate product designs are no different from the currently used methods since ANSI C63.10 is merely a repository for the current radio test methods that are spread over many different documents. Hence, the additional impact of ANSI C63.10 on the product design is negligible.

DOES THE NEW C63.10 REQUIRE MANUFACTURERS TO DO MULTIPLE COMPLIANCE TESTS FOR THE SAME EMC CHARACTERISTICS FOR DIFFERENT COUNTRY SALES?

FRASER: While it may not increase or reduce testing for other countries, it helps as a cross reference in unifying the methods between countries if anything.

DO YOU FEEL THAT THE GOALS WERE MET IN DEVELOPING EACH STANDARD?

HEIRMAN: Clearly both standards met their goals of helping the manufacturer get his/her product compliant. C63.10 makes finding the requirements easier and hence clearly meets the C63° goal of helping its organizations, which are many, including the FCC (see www.c63.org, click on “C63 main committee” and then click on “C63 Members List”). For C63.4, there are major additions that include, for example, new antenna calibration requirements (by referencing C63.5-2006) to make the measurements, how to test wall-mounted and ceiling-mounted equipment, what to present on the visual display, site validation requirements above 1 GHz, etc. Each of these is to be more explicit of these requirements, taking into account what has happened in measurement technology since 2003, which was the year

of the last edition of C63.4.

WALL: Yes, thanks to the support of all stakeholders (e.g., manufacturers, test labs, FCC and TCBs), the goals of the developers of C63.10 were met. The TCB Council should be commended for the support and development of C63.10.

WHAT DO YOU SEE AS NEEDED FOR THE NEXT EDITION?

STUMPF: The goal of work being done on the next edition [of C63.10] is to address updates and clarifications to currently accepted test procedures, to introduce test procedures where there currently are no definitive test procedures, and to introduce test procedures for new wireless technologies.

SCHAEFER: In the next revision of ANSI C63.4, a more detailed definition of the radiated emission measurement process for the frequency range above 1 GHz will be introduced. In addition, a site validation method involving the time domain measurement method will be included or referenced. Furthermore, a companion standard will probably be available that will detail the determination of the measurement uncertainty for the test methods included in ANSI C63.4.

The next revision of ANSI C63.10 will address the following:

- Additional instrumentation requirements (dynamic range, signal conditioning) and procedures (distance correction, reporting requirements and antenna pointing) above 1 GHz;
- MIMO, to reduce testing requirements;
- Band edge measurements, to distinguish between wide-band and narrow band modulation and develop suitable techniques for each class;
- Broadband system measurements;
- Dynamic Frequency Selection testing, to update and document current procedures;
- ERP/EIRP, to improve and document current procedures.

LOOKING FORWARD, WHAT FACTORS SHOULD REGULATORS TAKE INTO ACCOUNT IN THE DEVELOPMENT OF NEW EDITIONS OF BOTH STANDARDS?

WARD: A piece of personal advice to those in the standards industry: While each of us may think our way is best, don't reinvent the wheel just because you like 100 spokes and others like 50. Use what exists. Most all technologies, when boiled down to actual testing at the lab level, can be done in similar if not the same test methodologies. But that is just my own opinion.

FRASER: Procedures for new technologies, revision of current standards based on FCC, IC and other regulators feedback, questions on grants based on testing to 63.10, any test issues that may arise due to “real world” use of the standard. ■



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